

CLAIMS

What we claim is:

1. A process of preparing a protein isolate, which comprises:
  - (a) crushing oil seeds to form oil and oil seed meal therefrom,
  - (b) solvent extracting the oil seed meal to recover residual oil therefrom,
  - (c) removing solvent from the extracted oil seed meal at a temperature of below about 50°C to provide a desolventized oil seed meal,
  - (d) extracting the desolventized oil seed meal to cause solubilization of protein in said desolventized oil seed meal and to form an aqueous protein solution having a pH of about 5 to about 6.8,
  - (e) separating the aqueous protein solution from residual oil seed meal,
  - (f) increasing the protein concentration of said aqueous protein solution while maintaining the ionic strength substantially constant by using a selective membrane technique to provide a concentrated protein solution,
  - (g) diluting said concentrated protein solution into chilled water having a temperature of below about 15°C to cause the formation of discrete protein particles in the aqueous phase at least partially in the form of micelles,
  - (h) settling the protein micelles to form an amorphous, sticky, gelatinous, gluten-like protein micellar mass, and
  - (i) recovering the protein micellar mass from supernatant, the protein micellar mass having a protein content of at least about 90 wt% (N x 6.25) on a dry weight basis.
2. The process of claim 1 wherein said steps (d) to (i) are effected in a batch mode of operation.
3. The process of claim 1 wherein said steps (d) to (i) are effected in a semi-continuous mode of operation.
4. The process of claim 1 wherein said steps (d) to (i) are effected in a continuous mode of operation.
5. The process of claim 2 wherein said extracting of said oil seed meal is effected using an aqueous salt solution having an ionic strength of at least about 0.10 and a pH of

about 5 to about 6.8 and said aqueous protein solution has a protein content of about 5 to about 40 g/L.

6. The process of claim 5 wherein said salt solution has an ionic strength of about 0.15 to about 0.6.

7. The process of claim 5 wherein said salt solution has a pH of about 5.3 to about 6.2.

8. The process of claim 5 wherein said extracting of said oil seed meal is effected with agitation of said aqueous salt solution for about 10 to about 30 minutes.

9. The process of claim 8 wherein the concentration of oil seed meal in said aqueous salt solution during said extracting step is about 5 to about 15% w/v.

10. The process of claim 5 wherein said aqueous protein solution resulting from the extraction step has a concentration of about 10 to about 30 g/L.

11. The process of claim 3 wherein said extraction step is effected by:

(i) continuously mixing an oil seed meal with an aqueous salt solution having an ionic strength of at least about 0.10 and a pH of about 5 to about 6.8 at a temperature of about 5° to about 65°C, and

(ii) continuously conveying said mixture through a pipe while extracting protein from the oil seed meal to form an aqueous protein solution having a protein content of about 5 to about 40 g/L for a period of time up to about 10 minutes.

12. The process of claim 11 wherein said salt solution has an ionic strength of about 0.15 to about 0.8.

13. The process of claim 11 wherein the salt solution has a pH of about 5.3 to about 6.2.

14. The process of claim 11 wherein the concentration of oil seed meal in said aqueous salt solution in said mixing step is about 5 to about 15% w/v.

15. The process of claim 11 wherein said temperature is at least about 35°C.

16. The process of claim 11 wherein said aqueous protein solution has a protein content of about 10 to about 30 g/L.

17. The process of claim 1 wherein said extracting of said oil seed meal is effected using an aqueous salt solution having an ionic strength of at least about 0.10 and a pH of about 3 to about 5 or about 6.8 to about 9.9 and, following said separation of the aqueous

protein solution from residual oil seed meal, the pH of the aqueous protein solution is adjusted to a pH of about 5 to about 6.8.

18. The process of claim 17 wherein said salt solution has a ionic strength of about 0.15 to about 0.6.

19. The process of claim 17 wherein the pH of the aqueous protein solution is adjusted to a pH of 5.3 to about 6.2.

20. The process of claim 1 wherein said oil seed meal is canola oil seed meal and, following said separating of the aqueous protein solution from the residual canola seed meal, the aqueous protein solution is subjected to a pigment removal step.

21. The process of claim 20 wherein said pigment removal step is effected by diafiltration of the aqueous protein solution.

22. The process of claim 20 wherein said pigment removal step is effected by mixing a pigment adsorbing agent with the aqueous protein solution and subsequently removing the pigment adsorbing agent from the aqueous protein solution.

23. The process of claim 22 wherein the pigment adsorbing agent is powdered activated carbon.

24. The process of claim 1 wherein said oil seed meal is extracted with water and subsequent thereto salt is added to the resulting aqueous protein solution to provide an aqueous protein solution having an ionic strength of at least about 0.10.

25. The process of claim 1 wherein said concentration step is effected by ultrafiltration to produce a concentrated protein solution having a protein content of at least about 200 g/L.

26. The process of claim 25 wherein said concentration step is effected to produce a concentrated protein solution having a protein content of at least about 250 g/L.

27. The process of claim 25 wherein said concentrated protein solution is warmed to a temperature of at least about 20°C to decrease the viscosity of the concentrated protein solution but not beyond a temperature above which the temperature of the concentrated protein solution does not permit micelle formation.

28. The process of claim 27 wherein said concentrated protein solution is warmed to a temperature of about 25°C to about 40°C:

29. The process of claim 2 wherein said concentrated protein solution is diluted by about 15 fold or less by adding the concentrated protein solution into a body of water having the volume required to achieve the desired degree of dilution.
30. The process of claim 29 wherein said body of water has a temperature of less than about 10°C.
31. The process of claim 30 wherein said concentrated protein solution is diluted by about 10 fold or less.
32. The process of claim 3 wherein said concentrated protein solution is continuously mixed with said chilled water to provide a dilution of the concentrated protein solution by about 15 fold or less.
33. The process of claim 32 wherein said chilled water has a temperature of less than about 10°C.
34. The process of claim 33 wherein said dilution is by about 10 fold or less.
35. The process of claim 1 wherein the recovered protein micellar mass is dried to a proteinaceous powder.
36. The process of claim 1 wherein said recovered protein micellar mass has a protein content of at least about 100 wt% (N x 6.25).
37. The process of claim 1 wherein said oil seed meal is canola seed meal and, following recovering of the protein micellar mass therefrom, the supernatant is processed, on a batch, semi-continuous or continuous basis, to recover additional quantities of protein isolate therefrom.
38. The process of claim 37 wherein said additional quantities of protein isolate are recovered from the supernatant by concentrating the supernatant to a protein concentration of about 100 to about 400 g/L, preferably about 200 to about 300 g/L, and drying the concentrated supernatant.
39. The process of claim 37 wherein said additional quantities of protein isolate are recovered from the supernatant by concentrating the supernatant to a protein concentration of about 100 to about 400 g/L, preferably about 200 to about 300 g/L, mixing the concentrated supernatant with the recovered protein micellar mass, and drying the mixture.

40. The process of claim 37 wherein said additional quantities of protein isolate are recovered from the supernatant by concentrating the supernatant to a protein concentration of about 100 to about 400 g/L, preferably about 200 to about 300 g/L, mixing a portion of said concentrated supernatant with at least a portion of the recovered protein micellar mass, and drying the resulting mixture.

41. The process of claim 40 wherein the remainder of the concentrated supernatant is dried and any remainder of the recovered protein micellar mass is dried.

42. The process of claim 1 wherein, as an alternative to said diluting, settling and recovering steps, the concentrated protein solution is dialyzed to reduce the salt content thereof and to cause the formation of protein micelles, and recovering a protein isolate from the dialyzed concentrated protein solution having a protein content of at least about 100 wt% (N x 6.25) on a dry weight basis.

43. The process of claim 42 wherein said protein isolate recovery is effected by drying the dialyzed concentrated protein solution.

44. The process of claim 1 wherein said oil seed meal is canola oil seed meal.

45. The process of claim 44 wherein the canola oil seed meal is cold pressed canola oil seed meal.

46. The process of claim 44 wherein the canola oil seed meal is derived from a non-genetically modified canola oil seed.

47. The process of claim 1 wherein the oil seed meal is rapeseed meal.

48. The process of claim 1 wherein said oil seed meal is mustard seed meal.

49. The process of claim 1 wherein said solvent removal step is effected by air-desolventizing at a temperature of about 15° to about 25°C.

50. The process of claim 1 wherein said solvent removal step is effected under vacuum.